CLAIMS

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is as follows:

1. A method for data retrieval, said method comprising creating a set of related objects from a collection of objects including the steps of:

searching for a list of relevant objects and obtaining a rank-ordered list of said relevant objects;

selecting any target objects from the rank-ordered list;

mapping the relevant objects in the rank-ordered list into categories;

connecting the categories into paths in a graph, said graph having a node for each category and edges based upon category relationships;

terminating a graph traversal of said categories based upon reaching category nodes having at least one target object if there is a target object, and if there is no target object then terminating said graph traversal within a proximity in the graph near the most relevant category;

choosing a best path in the graph based upon a path evaluation criterion; and

selecting particular objects in categories on the best path based upon an object selection criterion.

2. A method as recited in claim 1, wherein the set of objects are linked.

3. A method as recited in claim 1, wherein the objects are documents.

4. A method as recited in claim 1, wherein the step of creating is to satisfy a user query.

5. A method as recited in claim 1, further comprising each object obtaining a relevance score.

6. A method as recited in claim 1, wherein the collection is stored in a repository.

7. A method as recited in claim 1, wherein the graph is a connected directed graph.

8. A method as recited in claim 1, wherein each of said related objects includes a metadata description, wherein said metadata description includes at least one of: a category; and a duration.

9. An article of manufacture comprising a computer usable medium having computer readable program code means embodied therein for causing data retrieval, the computer readable program code means in said article of manufacture comprising computer readable program code means for causing a computer to effect the steps of claim 1.

10. A method as recited in claim 8, wherein the step of mapping includes a step of accessing at least one category included in said metadata description;

11. A method as recited in claim 1, wherein said metadata description includes at least one of: a difficulty level, level of detail, resource type, media format, and a media type.

12. A program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform method steps for data retrieval, said method steps comprising the steps of claim 1.

13. A method as recited in claim 1, wherein the step of searching for related objects comprises employing a user criterion taken from a group of criteria consisting of: difficulty level greater

than, less than, or equal to one or more particular values, level of detail greater than, less than,, or equal to one or more particular values, resource type equal to one or more particular values, media format equal to one or more particular values, media type equal to one or more values, and any combination of these criteria.

14. A method as recited in claim 1, further comprising choosing target objects from the rank-ordered list.

15. A method as recited in claim 1, wherein the path evaluation criterion is a criterion taken from a group of criteria consisting of: path length higher than, lower than, or closest to a desired value, minimum or maximum path length, greatest number of target objects, highest sum or average of object relevance scores, highest sum of category scores averaging object relevance scores within categories, smallest number of breaks, smallest number of categories having a number of objects below a minimum number of objects, and any combination of these criteria.

16. A method as recited in claim 1, wherein the object selection criterion is a criterion taken from a group of criteria consisting of: membership in the set of target objects, highest relevance score, membership one or more categories on said best path, a total number of objects on said best path less than a maximum or greater than a minimum, a sum of the duration of the objects less than a maximum or greater than a minimum or closest to a desired value, and any combination of these criteria.

17. An apparatus for data retrieval, said apparatus comprising means for creating a set of objects from a collection of objects, said means for creating including:

means for searching for a list of related objects and obtaining a rank-ordered list of said related objects;

means for selecting any target objects from the rank-ordered list;

means for mapping the related objects in the rank-ordered list into categories;

means for connecting the categories into paths in a graph, said graph having a node for each category and edges based upon category relationships, and if there are target objects then terminating a graph traversal of said categories based upon reaching said target objects, and if there is no target objects then terminating said graph traversal within a proximity in the graph near the most relevant category;

means for choosing a best path in the graph based upon a path evaluation criterion; and

means for selecting particular objects in categories on the best path based upon an object selection criterion.

18. An apparatus as recited in claim 17, further comprising a repository to store the collection of objects.

19. A computer program product comprising a computer usable medium having computer readable program code means embodied therein for causing data retrieval, the computer readable program code means in said computer program product comprising computer readable program code means for causing a computer to effect the functions of claim 17.

20. A method for data retrieval, said method comprising assembling an ordered set of objects from a collection of objects to satisfy a query, said query including a maximum, minimum, or desired duration, said step of assembling comprising the steps of:

searching for a list of related objects and obtaining a rank-ordered list of said related objects;

selecting any target objects from the rank-ordered list;

mapping the related objects in the rank-ordered list into categories;

connecting the categories into paths in a graph, said graph having a node for each category and edges based upon category relationships, terminating a graph traversal of said categories based upon reaching target objects if there are target objects, and if there is no target objects then terminating said graph traversal within a proximity in the graph near the most relevant category;

choosing a best path in the graph based upon a path evaluation criterion;

selecting particular objects in categories on the best path based upon an object selection criterion;

sorting the particular objects on the best path according to a comparison function; and

obtaining said ordered set of objects satisfying said query.

21. A method as recited in claim 20, wherein the meta-data description includes a role.

22. A method as recited in claim 20, where in the step of sorting uses a comparison taken from a group of comparisons consisting of: the relative position of categories in a category order, the relative position of roles in a role order; the relative levels of difficulty on a difficulty scale, the relative duration on a time scale, or any combination of these comparisons.

23. An article of manufacture comprising a computer usable medium having computer readable program code means embodied therein for causing data retrieval, the computer readable program code means in said article of manufacture comprising computer readable program code means for causing a computer to effect the steps of claim 20.

24. A program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform method steps for data retrieval, said method steps comprising the steps of claim 20.

25. An apparatus for data retrieval, said apparatus comprising means for assembling an ordered set of objects from a collection of objects to satisfy a query, said means for assembling comprising:

means for searching for a list of relevant objects and obtaining a rank-ordered list of said relevant objects;

means for selecting any target objects from the rank-ordered list;

means for mapping the relevant objects in the rank-ordered list into categories;

means for connecting the categories into paths in a graph, said graph having a node for each category and edges based upon category relationships, and if there are target objects then terminating a graph traversal of said categories based upon reaching said target objects, and if there is no target objects then terminating said graph traversal within a proximity in the graph near the most relevant category;

means for choosing a best path in the graph based upon a path evaluation criterion; and

means for selecting particular objects in categories on the best path based upon an object selection criterion.

means for sorting the particular objects on the best path according to a comparison function; and

means for obtaining said ordered set of objects satisfying said query.

26. A computer program product comprising a computer usable medium having computer readable program code means embodied therein for causing data retrieval, the computer readable program code means in said computer program product comprising computer readable program code means for causing a computer to effect the functions of claim 25.

27. A method for data retrieval, said method comprising creating a set of objects from a collection of objects including the steps of:

searching for a list of relevant objects and obtaining a rank-ordered list of said relevant objects, each of said objects including a metadata file;

selecting any target objects from the rank-ordered list;

mapping the relevant objects in the rank-ordered list into categories, each category accessed from the metadata file;

connecting the categories into paths in a graph, said graph having a node for each category and edges based upon category relationships, and if there are target objects then terminating a graph traversal of said categories based upon reaching said target objects, and if there is no target objects then terminating said graph traversal within a proximity in the graph near the most relevant category;

choosing a best path in the graph based upon a path evaluation criterion; and

selecting particular objects in categories on the best path based upon an object selection criterion.

28. A method as recited in claim 27, wherein the step of creating is to satisfy a user query.

29. An article of manufacture comprising a computer usable medium having computer readable program code means embodied therein for causing data retrieval, the computer readable program code means in said article of manufacture comprising computer readable program code means for causing a computer to effect the steps of claim 27.

30. A program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform method steps for data retrieval, said method steps comprising the steps of claim 27.

31. A method for assembling a course from a collection of learning objects, said method comprising:

searching for a list of relevant learning objects and obtaining a rank-ordered list of said relevant learning objects;

selecting any target learning objects from the rank-ordered list;

mapping the relevant learning objects in the rank-ordered list into categories;

connecting the categories into paths in a graph, said graph having a node for each category and edges based upon category relationships, and if there are target learning objects then terminating a graph traversal of said categories based upon reaching said target learning objects, and if there is no target learning objects then terminating said graph traversal within a proximity in the graph near the most relevant category;

choosing a best path in the graph based upon a path evaluation criterion;

selecting particular learning objects in categories on the best path based upon an learning object selection criterion;

sorting the particular learning objects using at least one of: a category order, a role order, and any other sorting for metadata included in the metadata file; and

linking the particular learning objects to form the course.

32. An article of manufacture comprising a computer usable medium having computer readable program code means embodied therein for causing assembly of a course, the computer readable program code means in said article of manufacture comprising computer readable program code means for causing a computer to effect the steps of claim 31.

33. A program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform method steps for assembling a course, said method steps comprising the steps of claim 31.

34. A method as recited in claim 20, wherein the object selection criterion is a criterion taken from a group of criteria consisting of: membership in the set of target objects, highest relevance score, membership one or more categories on said best path, a total number of objects on said best path less than a maximum or greater than a minimum, a sum of the duration of the objects less than a maximum or greater than a minimum or closest to a desired value, the highest ranking objects within each category, the highest ranking objects within categories within a proximity in the graph near the most relevant category, and any combination of these criteria.

35. A method as recited in claim 20, wherein the set of objects are linked.

36. A method as recited in claim 35, wherein the objects are Web resources and the set of objects are linked using hyperlinks.

37. An apparatus as recited in claim 25, further comprising a computer program product providing a means for displaying the course.

38. A method as recited in claim 2, wherein the objects are Web resources and the set of objects are linked using hyperlinks.

39. An apparatus as recited in claim 17, further comprising means for displaying the particular objects.

40. A method as recited in claim 20, said query including a maximum, minimum, or desired duration.